

Student directions *Geometric Optics* activity: Images from Lenses

Learning Goals: Students will be able to explain

- How an image is formed by a converging lens using ray diagrams
- How changing the lens effects where the image appears and how it looks
- Explain the features a lens would need to be used in real applications

1. When you did the lens lab and had the light bulb on one side of the magnifying lens, you were able to see a projection of the light bulb on your note card as in figure

1. How do you think the lens changes the light coming out of the bulb to make an image?

Discuss your ideas with your partner and then make a drawing to demonstrate your ideas.

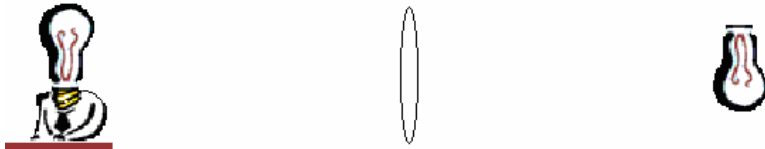


Figure 1

2. Open the *Geometric Optics* simulation. Investigate to see if your ideas make sense. Write an explanation of what causes a lens to form images.

Include sketches of several situations to demonstrate why the image size and location vary?

3. When we did the lens lab, the projection of the light bulb was upside down.

Talk about what you think is happening that makes the image is upside-down.

Make sketches of your thoughts.

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4. Test your ideas, using *Geometric Optics*, by selecting the pencil as an object. Copy the pencil, lens, rays and image.

Then, in a different color, add the rays that would be coming off the head of the pencil. Show your drawings to Ms. Duncan and be prepared to explain your thinking.

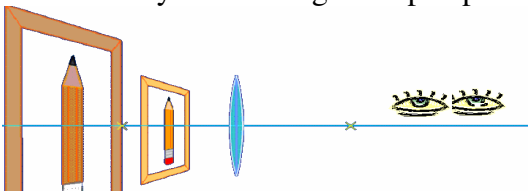
5. Use your magnifying lens to look at this paper.

- Investigate to find out how to use the lens to make words appear larger.
- Draw pictures that show how size and apparent position is affected by the distance between the lens and the paper.
- Discuss with your partner how you think the image is formed. Make a sketch to support your ideas.

6. Use *Geometric Optics* with **Virtual Image** turned on; keep the object on the left side. Imagine that you are on the right looking into the lens like the picture below.

- Make a sketch like the one below. Draw the rays that make the image.

- Use your drawing to help explain how a magnifying lens works.



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7. If you wanted to make your own lenses for a telescope, what features of a lens do you think would affect the images that you can see?

- Use the simulation to check your ideas. Investigate, and then summarize how each variable affects the way an image looks and where it appears.
- Describe the characteristics that you might chose for a telescope lens.
- What characteristics would you select if you were going to make a microscope?